DOCUMENT RESUME

ED 157 296 EC 111 781

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TITLE New Opportunities for Visually Handicapped People Through Applying Today's Technology.
PUB DATE Jun 78
NOTE 15p.; Paper presented at the World Congress on Future Special Education (First, Stirling, Scotland, June 25 - July 1, 1978)

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Blind; *Electromechanical Aids; *Research Utilization; *Sensory Aids; *Technology; Visually Handicapped

ABSTRACT

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New Opportunities for Visually Handicapped People Through Applying Today's Technology

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Reference: "International Perspectives on Futures in Special Education"

A paper presented at the CEC 1st World Congress, Stirling, Scotland, June 25 - July 1, 1978.

Prepared with generous assistance from the staff at Telesensory Systems Inc., Palo Alto, California.

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Abstract

The application of advanced technology to the needs of handicapped people is of increasing importance, not only to the end user, but to people in the fields of rehabilitation spe.ial education and the public at large. This paper offers suggestions to improve today's climate for technological aids for the blind, describes some currently available aids and some future possibilities from today's research and addresses the question of programmed implementation.

New Oppertunities for Visually Handicapped
People Through Applying Today's Technology

Today's Climate for Technological Aids for the Blind

Modern technological aids, specifically designed for the blind, have been widely available only a relatively short time. However, their importance in the educational, vocational, and living skills development of the blind has rapidly increased to the point that laws have been modified, major funding established, and large programs instituted to disseminate these aids. The application of advanced technology to the needs of handicapped people is of increasing importance, not only to the handicapped end user, but to people in the fields of rehabilitation, special education, and the public at large.

While scientific and field evaluations of technological aids for the blind can give an indication of their value, the real test, which ultimately determines whether they continue to be available, is whether these aids are actually purchased. In this field, the end-user and the funding source are often separate entities, so it becomes the responsibility of the funding source to represent the end-user by expressing his needs and desires in purchase decisions. This becomes especially difficult and complicated when a high technology aid is proposed, and has not been subject to independent field evaluations, or experience in the field does not exist. What is needed is a set of criteria to help put technological ideas into proper perspective. To help in this regard, here are six criteria with which to evaluate a proposed new idea:

Match Between Technical Objectives and the Needs of the Blind. If all technical objectives are achieved, does the concept provide the solution to a real need? Have objective studies been carried out with sufficiently large populations of blind people to ascertain the benefits and the conditions in which these benefits are obtained?

Technical Feasibility. Is it reasonable to expect that the technological goals can be achieved? Are the goals within the state-of-the-art or is a breakthrough required?

Cost Feasibility. Is the potential value or worth of the device greater than the projected materials and labor costs?

Credibility of Product Proponents. Who are the product proponents? Do they demonstrate a genuine concern and understanding of the needs of the blind? What is their past involvement with the blindness system? Do they have a successful track record in the field of technological aids for the blind?

Organizational Credibility. Does the organization have a successful history with other related products? Is the organization responsive to consumer feedback? Does the organization have a long range commitment to the product, or is it only looking for a short term financial or public relations gain?

Organizational Stability. If equipment is purchased today, is there reason to believe that service, spare parts, and other support will be available next month, next year, and ten years from now? Does it have adequate financial resources?

Consumer advocacy in the field of technological aids for the blind is coming of age now, and it needs to be organized, visible, responsible,

and bold. The continued vitality and productivity of the aids industry depends on it, and the studies which will be made in the alleviation of disabilities through the application of technology are now, and will continue to be, dependent on responsible consumer support by people like you.

Some Currently Available Technological Aids

Particularly pertinent to this conference are some examples of technological aids currently available. Let me provide you with some examples of products whose need for consumer attention ranges from evaluation among different populations, to creative program development, to thorough dissemination programs.

The Optacon Print Reading Aid for the Blind

The Optacon was developed over eight years of research headed by the Electronics Laboratory of Stanford University. Close attention was given to meeting the actual reading needs of blind people. Through using the latest developments in integrated circuit technology, the Optacon was made small enough to be completely portable and inexpensive enough to be individually owned. It includes a small, hand-held scanner -- the camera. The character being read is felt tactually by the index finger of the opposite hand. The Optacon, as a direct translation aid, is thus useful for reading a wide range of alphabets, languages, type styles, numbers, graphic symbols, and diagrams.

The list of professions in which blind people are using Optacons began with computer programmers, and it has grown to include secretaries, businessmen, scientists, lawyers, doctors, rehabilitation counselors, teachers, and many more. With the Optacon, their printed

materials can be read immediately and independently.

SPEECH+ Talking Calculator

Based on the success of the Optacon, the company founded by the Optacon developers began a study in August 1974 to provide visually handicapped people with an electronic calculator. Computational barriers continue to plague blind students throughout their studies and also affect the vocational pursuits of blind adults. Based on these computational needs, a hand-held electronic calculator was developed for the visually handicapped.

In March 1976, a study was undertaken to determine whether blind school children were able to compute mathematical formulas with ease, speed, and accuracy using the SPEECH+ calculator as a computational aid. The study was conducted by Dr. Richard R. Champion, Professor of Special Education, San Francisco State University, and was funded by a grant from the Smith-Kettlewell Eye Research Foundation.

Results of the study were extremely positive. A 29% gain was noted in the mean raw score for the computation subsection, while a 20% gain was made in the mean raw score for the mathematical concept subsection. Subjects also took 31% less time to complete the computational subsection and 24% less time to complete the concept subsection using the SPEECH+ calculator.

Other educators have commented that the talking calculator is valuable not only because it can increase achievement but also because it can make the blind person's experience with quantitative expression more closely resemble that of a sighted person and enhance their vocational opportunities. The SPEECH+ is available in three other languages

besides English, and there are over 5,000 SPEECH+ units throughout the world.

The Game Center

Another new device has been developed in an area where technology has not before been applied to the needs of the blind: electronic games. We have a system which is programmed to play a number of distinctly different games, all of which use only auditory outputs, including synthetic speech. Some of the electronic games included are similar to the popular "PONG" game, which is a kind of electronic tennis, as well as skeet shoot, dice, blackjack, tic-tac-toe, and others.

The games test a person's memory, reflexes, sense of timing, and listening ability. More importantly, though, the games afford a joyful opportunity for blind people (and sighted people if they wish) to have fun together.

The Crib-O-Gram

Another recent development is a device designed to detect hearing handicaps in infants. Called the Crib-O-Gram, this is a portable device for providing a completely automated method for screening profound hearing loss in newborn infants, in either well-baby clinics or intensive care nurseries. The importance of neonatal auditory screening is generally recognized insofar as early treatment markedly improves prognosis. Invented by Dr. F. Blair Simmons at Stanford University School of Medicine, the Crib-O-Gram now provides a practical and reliable procedure for the mass screening of newborns' hearing at a very low cost per child. The Crib-O-Gram in an automated form will be introduced in mid-1978.

Future Possibilities from Today's Research

Voice Output Reading System

The Optacon has been very successful in providing flexible, independent access to all types of printed matter to the blind. Despite this success, reading rates are inconveniently slow relative to sighted readers for many important situations because the blind user must perceive and interpret a tactually presented image of each letterspace.

As early as 1967, the Optacon engineering group was concerned with the feasibility of an accessory unit that would plug into the Optacon and speak words as the user scanned them with the Optacon camera. The engineering team's objective is to develop a speech output reading system which can be used in any of three ways: (a) The Optacon with a voice accessory (hand scanned print with voice output), (b) the Optacon with a voice accessory and an automatic tracking unit (auto scanned print with voice output), and (c) a totally automated voice reading system (no Optacon necessary).

There are many reading activities at home, at work, at school, while travelling, and so on. We need to read memos, correspondence, advertisments, labels, forms, directories, as well as newspapers, magazines, and books. In some of these reading tasks we need to read rapidly, while in others we are willing to sacrifice some speed for portability and flexibility. The approach is to provide a compatible system of units which can be plugged together in various configurations for different reading tasks -- such as a page in a typewriter, an electronic calculator display, a notice on a bulletin board,

a memo, or a book.

The engineering group has set a design goal on price that will permit personal ownership of this machine -- this means that the price must be under, and preferably well under, $10,000. While this price is still very high for most of us who are of ordinary means, it is important to realize that this machine will make a blind person more competitive with his sighted peers in terms of reading; and this fact in turn implies that the educational and vocational applications of such a reading device are enormous. Considering the probability that such a system will mean a great improvement in a blind person's lifetime earning power, the original cost of the machine becomes less of an obstacle. Furthermore, the clear trend throughout the world towards governmental assistance for the disabled will ultimately help ease the financial burden of purchasing new technological aids such as this voice output reading machine.

As to the question of when the machine will be available, an experimental system is now fully operational. This system is being used to gather extensive consumer preference information, enabling the final product to be the most effective instrument possible for the greatest number of people and the widest possible range of uses. Production units will incorporate the changes recommended by the field evaluation and we hope that the production machine will be available beginning in late 1979 or early 1980. In addition, cooperation is being pursued with research groups around the world for development of software required to synthesize languages other than English.

Paperless Braille

Another project of concern has been the archaic methods of writing available for use by the blind. Writing with a slate and stylus is noisy, slow, and complicated. A braillewriter is noisy, heavy, and relatively slow. Neither method has received any attention with respect to possible impacts due to the technological revolution over the past 25 years. How can modern technology be applied to improve read/write systems for the blind?

The concept being explored can be visualized if one thinks of a battery-operated unit a little larger than the size of a portable cassette tape recroder. Along one side of this unit would be a silent electronic keyboard with keys similar to those on many calculators, but laid out to input braille. There would also be an electronically-operated dynamic braille display of ten or more cells. The unit would also contain a cassette tape recorder (complete with microphone) together with a solid state memory and microcomputer circuits. At no time in this process would paper be needed. Instead, cassette tapes would be used with a great reduction in bulk since one cassette could hold an entire book. One machine will serve as a tape recorder and a braillewriter, with efficient editing, filing, indexing, and playback capabilities. (A braille printer could always be coupled to the device if it would ever be necessary to have a paper copy). This concept holds considerable promise as an efficient tool for blind people.

Marketing and Dissemination

Programs and Limitations

There are over 4,000 Optacons in the field today. This year more

blind people will be trained to read with the Optacon in the United States than will be trained to use guide dogs. Also, a major effort is being made to establish worldwide training personnel so blind students can learn to use the Optacon in their own language and preferably in their own country. One successful program of distribution began in 1976 when the U. S. Office of Education funded the first year of a planned three-year program to disseminate Optacons to schools throughout the United States. Over the next few years, this program should greatly increase the educational application of the Optacon system. Last June Optacon-trained blind students graduated from U. S. high schools and entered the job market and college programs, and the number of these students will increase every year. There are five major areas where growth is needed to expand the application of Optacon technology. These areas are: (1) vocational education, (2) international school programs, (3) follow-up training, (4) the college student, and (5) deaf-blind persons.

Internationally, several countries have good, sound school Optacon training programs, but much more growth in this area is needed.

Employment Development

A major goal in the development of sensory aids has been to improve employment opportunities for visually handicapped people. The Optacon was first widely applied in the field of computer programming, to improve the competitive position of blind computer programmers faced with the advent of visual display terminals.

An example of an employment area presently being pursued is that of the telephone assistance operator. Blind people in many countries have found employment as phone operators, but their jobs are in jeopardy

now because of the tendency toward building only visual indicators into the equipment they use.

Together with the Pacific Telephone Company and the Sensory Aids Foundation in the U. S., an accessory to the present telephone operator console has been developed which electronically senses the visual indicators. This accessory converts the information into synthetic speech so the blind operator can process the incoming call. A 45-word vocabulary is used to report relevant information in place of the lighted pushbuttons and numbers used for a sighted operator.

Presently, there are over 100,000 operators in 2,000 offices across the U. S. We think there is the possibility for at least one blind operator in each office, or a potential for thousands of jobs for the blind in the U. S. alone.

Conclusions

To date only a disappointingly small dent has been made in the problem of facilitating productivity of the blind through technological aids. As examples, I have described some of the unmet needs which could be helped today with the Optacon and SPEECH+ calculator. I have also described some promising research projects which I hope will enable an even larger contribution to be made to the blind in the future.

The power source which makes the provision of useful aids for the blind an effective process is the financial commitment of the government and private agencies of and for the blind. Too often, most of this expenditure must relate to provisions of the necessities of life for the blind, or income maintenance. Too little has been committed to transformation of the blind from the position of welfare recipient

to that of independent producer in our economic system. Good technology, intelligently applied, promises to help blind people be more productive members of society. In such a transformation all parties gain -- the blind person, the government, private agencies, and society as a whole.

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